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The pleistocene environment in Southern Africa
Hypothetical vegetation in Southern Africa during the pleistocene*

THE PRESENT NATURAL VEGETATION

A "Vegetation Map of Africa south of the Tropic of Cancer" was published recently, together with explanatory notes by Keay (1959), and this serves to provide an excellent summary of present knowledge for this region. Figure 1 is based largely on this map but has been modified in some details where later information is available or where there seem to have been omissions from the compilation. There are also some differences in detail as compared with the vegetation map given by Wellington (1955) but the general pattern is the same and his text and photographs should be consulted for concise data on the vegetation types which are distinguished.

THE PLEISTOCENE VEGETATION

Method of preparing the hypothetical vegetation maps

In preparing the hypothetical vegetation maps it has been necessary to assume that the Pleistocene rainfall pattern accorded with that of the present day as far as the major features are concerned. That this assumption is probably incorrect in detail is freely admitted but it seems to be the best assumption that can be made until the other modifying factors can be estimated more reliably; indeed without this starting point no hypothetical reconstructions can be attempted. In accordance with geological inferences discussed elsewhere (see Cooke *in press*), it is also assumed that the total precipitation varied all over the region from about 60 per cent of its present amount during the dry phases to about 140 per cent during the wet periods. No account is taken of any possible northward extension of the winter rainfall belt and the superimposed effects of temperature are ignored so as not to introduce additional complications. If, as is likely, the actual temperatures were higher during the dry phases and lower during the wet ones, these changes would increase still further the trends of the vegetation patterns away from that of the present day.

Before constructing the hypothetical vegetation maps, an analysis of the present vegetation was made for the purpose of evaluating the factors which appear to control the distribution of each of the present vegetation types, incuding rainfall, surface temperature, temperature range, altitude and geological or soil features . . . Two hypothetical rainfall maps

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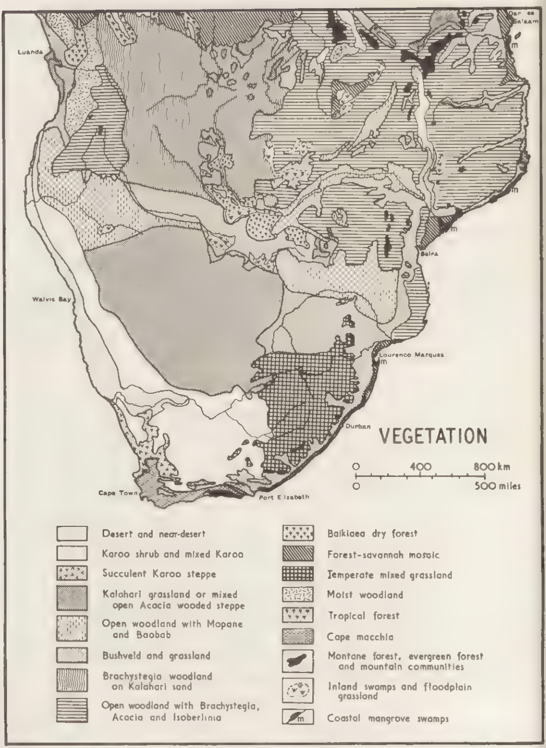
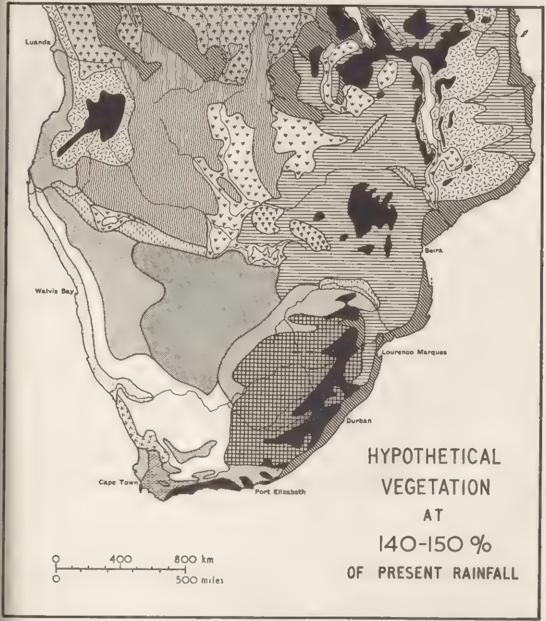
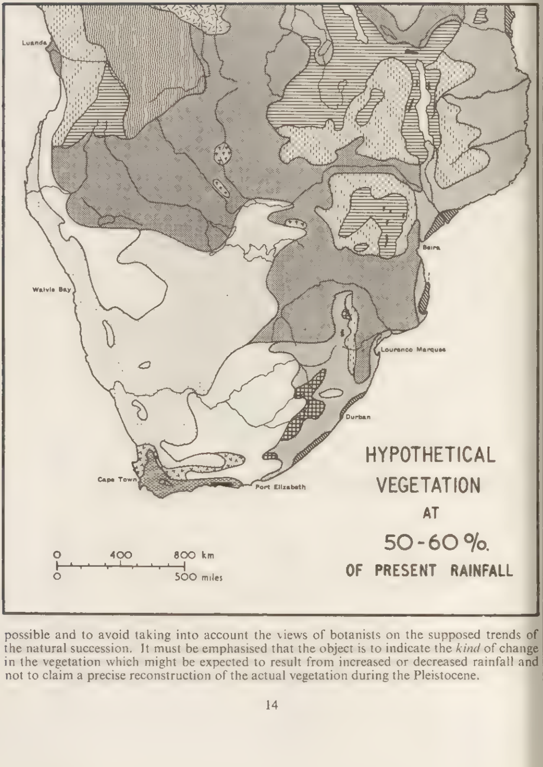
Ann. Cape Prov. Mus. II. 1962. South Africa.


VEGETATION
0 400 800 km
0 500 miles
Luanda
Dar es Salaam
Walvis Bay
Beira
Lourenco Marques
Durban
Cape Town
Port Elizabeth
m
Desert and near-desert
Karoo shrub and mixed Karoo
Succulent Karoo steppe
Kalahari grassland or mixed open Acacia wooded steppe
Open woodland with Mopane and Baobab
Bushveld and grassland
Brachystegia woodland on Kalahari sand
Open woodland with Brachystegia, Acacia and Isoberlinia
Baikiaea dry forest
Forest-savannah mosaic
Temperate mixed grassland
Moist woodland
Tropical forest
Cape macchia
Montane forest, evergreen forest and mountain communities
Inland swamps and floodplain grassland
Coastal mangrove swamps



were then drawn with isohyets based on 140 per cent and on 60 per cent of the present values respectively. Each of these was then superimposed on the unaltered maps of surface temperature etc. and hypothetical boundaries were drawn for each vegetation type on the basis of the criteria previously determined. Every effort has been made to keep the interpretation as objective as



possible and to avoid taking into account the views of botanists on the supposed trends of the natural succession. It must be emphasised that the object is to indicate the *kind* of change in the vegetation which might be expected to result from increased or decreased rainfall and not to claim a precise reconstruction of the actual vegetation during the Pleistocene.

Hypothetical vegetation at 140–150% *present rainfall* (*Fig.* 2)

Comparison with the present vegetation map shows no startling features although there is a considerable amount of change in detail. Particularly marked is the apparent effect on the forest areas, which are greatly expanded and extend to much lower altitudes than at present. It is to be expected that the wet valleys would also have carried long tongues of forest far beyond the borders of the forest areas themselves. Another feature is the considerable southward extension of the area suitable for *Brachystegia* vegetation, which might have penetrated the eastern Transvaal lowveld and even northern Natal. Moist woodland would have replaced much of the *Brachystegia* type in northern Mozambique and southern Angola, while tropical forest extended towards the watershed of the Congo basin where the Kalahari sand is not present. The areas suitable for mopane seem to be much reduced. It would also seem likely that large areas of swamp and floodplain grassland would have occurred in Northern Rhodesia. The area of Kalahari grassland is diminished and the South West African highlands off the sand area could have supported bushveld and grassland.

Hypothetical vegetation at 50–60% *present rainfall* (*Fig.* 3)

The inferred pattern is rather startlingly different from that of the present day, particularly in the southern Kalahari region where the precipitation falls to marginal levels and suggests the existence of near-desert conditions. The *Brachystegia* areas are greatly diminished and there is a correlative expansion of the mopane and baobab vegetation. The area suitable for temperate mixed grassland is greatly reduced and the evergreen and montane forests would apparently be restricted to small residual patches and to protected valleys. It would seem likely that the thornbush and grassland normally characteristic of the Bechuanaland area would have spread far northwards to replace *Brachystegia* vegetation over most of the Kalahari sand region. It would also appear that much of the area now occupied by bushveld and grassland or mopane and baobab would have been more suited under these conditions to the type of vegetation now growing in Bechuanaland, despite the absence of a sand blanket. The area of the Cape macchia would be little affected owing to its great tolerance of environmental conditions but a considerable part of the area would have been intermingled with succulent vegetation. The reduced rainfall doubtless served also to eliminate most of the swamp areas and perhaps desiccate the minor lake basins. Over a very considerable part of the region under these conditions surface water would be scarce and much of it seasonal in character.

REFERENCES

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DISCUSSION

Dr. Brain: The tendency in the past has been to over-emphasise the degree of the change in the rainfall in the Pleistocene. What evidence we have is that it may be of the order of 25 per cent either way but probably not as large as 50 per cent, as in Dr. Cooke's map. Furthermore these changes appear to have been of brief duration, so that it is unlikely that vegetation would have reached an equilibrium as complete as suggested by the maps. This is particularly the case with recent changes, which might have lasted c. 25–30,000 years. The first pluvial may have lasted twice or three times as long, but the evidence for this is not conclusive.